SSVEO IFA List **Date:02/27/2003**

STS - 32, OV - 102, Columbia (9) **Time:04:20:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:00	Problem	**FIAR**	**IFA** STS-32-V-01	C&T
INCO-01	**GMT:** 009:12:35		**SPR** 32RF01	**UA**	**Manager:**
			IPR	**PR** COM-2-10-0136	
					Engineer:

Title: S-Band FM Transmitter 1 Power Output Went to Zero (ORB)

Summary: DISCUSSION: RF output power of S-band FM transmitter 1 dropped to zero at 09:12:35:03 G.m.t., approximately 2.7 seconds after SRB ignition. FM transmitter 2 was selected by ground command approximately 50 seconds later and performed nominally for the duration of the mission. On-orbit troubleshooting confirmed the loss of output for FM transmitter 1. Telemetry measurements indicated the transmitter was receiving the proper input commands but no RF output power was present.

CONCLUSION: The most probable cause of the FM transmitter 1 loss of RF output power was a failure internal to the transmitter. CORRECTIVE_ACTION: The FM transmitter has been removed, replaced, and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 32RF01. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:01	Problem	**FIAR**	**IFA** STS-32-V-02	APU
MMACS-01	**GMT:** 009:12:36		**SPR** 32RF02	**UA**	**Manager:**
			IPR	**PR** APU-2-10-191	
					Engineer:

Title: APU 3 Lubrication Oil Outlet Pressure High During Ascent (ORB)

Summary: DISCUSSION: Auxiliary power unit (APU) 3 lubrication (lube) oil outlet pressure (V46P0353A) rose to a higher-than-normal value during ascent. The pressure peaked at 90 psia and remained at high levels for 6 minutes before returning to a nominal range of 50 to 60 psia 4 minutes prior to APU shutdown. This scenario

is indicative of hydrazine in the gearbox reacting with the lube oil to form a wax (hydrazide) and a granular solid (pentaerythritol) that will partially plug the lube oil filter and cause the lube oil outlet pressure to increase. As the lube oil temperature increases to the nominal operating temperature, the wax and pentaerythritol in the filter melt and the lube oil outlet pressure returns to normal. Postflight analysis of the lube oil revealed a total filterable solids concentration of 10 mg/100 ml, whereas specifications require less than 5 mg/100 ml.

The lube oil was most probably contaminated with hydrazine prior to preflight servicing when the seal cavity pressure was above the gearbox pressure for nearly 3 weeks (as is normal). Wax may have formed during this time, and the wax was not totally cleared during subsequent lube-oil flush operations. There is no effect on APU performance if the oil filter becomes completely blocked. A bypass valve will bypass oil around the filter at a lube oil outlet pressure of about 100 psia (50-60 psid). Normal filter pressure differential is about 5 psid at normal flow rates. This condition occurred during STS-4 (Flight Problem STS-04-05). CONCLUSION: The rise in the APU 3 lube oil outlet pressure during ascent was caused by the partial blockage of the lube oil filter with wax and pentaerythritol. These contaminants were introduced into the system preflight when the lube oil was contaminated with a small amount of hydrazine. As the lube oil temperature increased during ascent, the material blocking the filter melted, allowing the lube oil outlet pressure to return to normal. CORRECTIVE_ACTION: The lube oil system was to have been drained and flushed, and the lube oil filter changed. This was required because of violation of the OMRSD maximum lube oil pressure limit of 75 psia. Because of an unrelated problem found during ground processing, however, APU 3 was removed and replaced. APU processing changes under consideration to preclude introduction of hydrazine into the gearbox include pressurization of the gearbox to a level above the drain system pressure as soon as possible after landing, and implementation of a hot oil flush requirement at KSC. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-32-V-03	OI - Sensors
A) PROP-01; B) MMACS-02; C) EECOM-01; D) MMACS-03;	**GMT:**		**SPR** A) 32RF03; B) 32RF04; C) 32RF05; D) 32RF10; E) 32R	**UA** **PR** B) APU-2-10-188; C) ECL-2-10-558; F) ECL-2-	**Manager:** **Engineer:**
			IPR A) 35V-0030; D) 35V-0014; E) 35V-0031	10-561;	

Title: Operational Instrumentation Failures (ORB)

Summary: DISCUSSION: A. The right orbital maneuvering system (OMS) Helium pressure 2 (V43P5122C) failed off-scale low at the start of the OMS-2 burn. It recovered following the burn and operated nominally for the duration of the mission. The OMS pod will not be removed this flow. Troubleshooting will be deferred until OMS pod removal. Fly as is. Final closure will be tracked by CAR 32RF03. This is a criticality 3 measurement. This problem is closed.

B. The auxiliary power unit (APU) exhaust gas temperature (EGT) 3 (V46T0340A) failed during entry. The sensor was removed and replaced. Final closure will be tracked by CAR 32RF04. This is a criticality 3 measurement. This problem is closed. C. Freon coolant loop 2 evaporator outlet temperature (V63T1407A) response was slow. Postflight inspection revealed that the sensor was debonded. The sensor has been rebonded, retested and is ready for flight. Final closure will be tracked on CAR 32RF05. This is a criticality 2R3 measurement. This problem is closed. D. The APU 2 injector temperature (V46T0274A) was biased approximately 50 degrees F above the gas generator bed temperature (V46T0222A). The gas generator bed temperature was nominal since the GG bed temperature trace was within the heater control range. Postflight troubleshooting indicated the thermal reference junction (TRJ) for the injector temperature was not operating properly and will be replaced (reference PR APU-2-10-0194). The signal conditioners and sensors for both measurements were checked out and found to be within specification. Final closure will be tracked on CAR 32RF10. This is a criticality 3 measurement. This problem is closed. E. The right OMS fuel pressure transducer (V43P5321C) was erratic. The pressure varied 4 to 10 psi intermittently. This transducer exhibited the same behavior during STS-28. Troubleshooting will be performed during the next scheduled removal of the right OMS pod. Fly as is. Final closure will be tracked by CAR 32RF14. This is a criticality 3 measurement. This problem is closed. F. Supply water tank B quantity measurement (V62Q0420A) experienced numerous off-scale low transients (also occurred on STS-28). The sensor has been removed and replaced. Failure analysis will be tracked on CAR 32RF19. This is a criticality 2R3 measurement. This problem is closed. G. APU 2 EGT 2 (V46T0240A) was erratic, then failed during entry. The sensor was removed and replaced. Final closure will be tracked on CAR 32RF23. This is a criticality 3 measurement. This problem is closed. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:01	Problem	**FIAR**	**IFA** STS-32-V-04	OMS/RCS
None	**GMT:** 009:12:36		**SPR** 32RF06	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Right OMS Yaw Actuator Movement During Ascent. (ORB)

Summary: DISCUSSION: The right orbital maneuvering system (OMS) yaw actuator drifted 0.11 degree during the first 50 seconds of flight. This exceeded the 0.10 degree OMRSD specification. Up to 0.70 degree of drift is allowed during ascent before onboard fault detection will enable the primary and/or secondary system to null error. The primary gimbal actuators remained selected for the entire mission and no subsequent anomalies were observed. Movement during entry was 0.048 degree.

The OMRSD limit for ascent is intended to identify any rapid or unexpected degradation of the no-back device, and along with data analysis will determine acceptability for the next flight. This actuator (serial number 117) has flown on four previous flights, and has shown drifts of 0.082 to 0.098 degree during ascent. An engineering evaluation of past history on this and all actuators has determined that performance of this actuator on this flight was within the expected range when normal aging is considered. As a result, the OMRSD limit has been changed to 0.20 degree effective on the next flight of all vehicles (reference PRCBD S053147D). CONCLUSION: The right OMS yaw actuator is acceptable for reflight. CORRECTIVE_ACTION: None. EFFECTS_ON_SUBSEQUENT_MISSIONS: OMRSD limit has been increased to 0.20 degree.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:19:36	Problem	**FIAR** JSC-EE-0658	**IFA** STS-32-V-05	TAGS
INCO-02	**GMT:** 010:08:11		**SPR** None	**UA**	**Manager:**
			IPR	**PR** COM-2-10-0137	
					Engineer:

Title: Text and Graphics System Capstan Paper Jams (GFE)

Summary: DISCUSSION: At about 010:08:10 G.m.t., the text and graphics system (TAGS) hardcopier experienced a paper jam while imaging an uplink message. The crew found the jam in the capstan area of the hardcopier while performing a malfunction procedure. The crew cleared the jam and rethreaded the paper, per the malfunction procedure. Normal operations were resumed. The same type of jam recurred several times during the following two mission days. In each instance, the crew cleared the jam and normal operations were resumed. Meanwhile, real-time failure analysis by ground engineering personnel isolated the cause of the recurring jams to a defect in the hardcopier lower paper path that was providing a catch point for the leading edge of pages moving away from the capstan. An in-flight maintenance (IFM) procedure was devised to correct the problem temporarily by covering the rough spots on the upper surface of the lower paper path with a liner made of two strips of TAGS paper secured in place with tape. The IFM procedure was successfully implemented by the crew and normal TAGS operations were continued without incident for the remaining five days of the mission. Postflight inspection and failure analysis confirmed the existence of a manufacturing defect in the hardcopier lower paper path, and it was sufficient to impede paper movement and cause occasional capstan paper jams. The defect consisted of a small gap between two improperly joined sheet metal parts where the leading edge of an advancing sheet of paper could catch.

CONCLUSION: The paper jams occurred in the capstan area of the TAGS hardcopier and were caused by a non-generic manufacturing defect in the lower paper path. CORRECTIVE_ACTION: The TAGS hardcopier, part no. AV14453-303, serial no. 002, was removed, replaced, and subjected to failure analysis. The unit was repaired by replacing the defective paper path assembly. All other flight units were inspected for similar defects. Only hardcopier serial no. 006 (currently not in active flight status) was found to have such a defect and this unit will be repaired prior to flight usage. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:01	Problem	**FIAR**	**IFA** STS-32-V-06	MPS
None	**GMT:** 009:12:36		**SPR** 32RF07	**UA**	**Manager:**
			IPR	**PR** MPS-2-10-0606	
					Engineer:

Title: MPS Engine 2 GO2 Flow Control Valve Sluggish (ORB)

Summary: DISCUSSION: The main propulsion system (MPS) gaseous oxygen (GO2) flow control valve (FCV) of engine 2 exhibited sluggish behavior during its first opening cycle, which occurred 61 seconds after lift-off during the throttle-up period. Although the valve displayed no hang-up behavior by responding promptly to the open (de-energization) command, it required approximately 0.75 second to fully open. The specifications allows 0.40 second. The subsequent seven cycles of the valve were nominal. The engine 1 and 3 GO2 FCV's completed 9 and 4 nominal cycles, respectively.

Postflight inspection of the engine 2 GO2 FCV revealed nominal poppet-to-sleeve clearances and minor self-generated contamination. The combination of contamination and transient adhesion between similar metals in the low-flow position was probably sufficient to cause the stiction. Although the GO2 FCV's experience a thermal transient environment after engine start as a result of changing from cold-soak conditions to hot-gas flow, this was not a contributing factor since the anomaly occurred sufficiently late in the ascent to have allowed the thermal conditions to stabilize. CONCLUSION: The engine 2 GO2 flow control valve experienced sluggish movement during its first opening cycle. The cause of this sluggishness is not fully explained, but internal wear and self-generated contamination are suspected to have contributed to the anomaly. CORRECTIVE_ACTION: All three GO2 FCV's were removed and replaced. KSC flight processing procedures were modified (RCN's SS9433B and OV9470) to include current signature tests prior to aft compartment close-out on the pad to verify that the FCV's are in a known open position for flight. The valves will not be cycled again prior to launch. Beginning with STS-41, the FCV's will remain in a fixed-flow (fixed orifice) position. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:19:43	Problem	**FIAR**	**IFA** STS-32-V-07	Atmospheric
A) EECOM-02; B)	**GMT:** 011:08:18		**SPR** A) 32R08; B)	**UA**	Revitalization Subsytem
EECOM-05			32RF15	**PR** ECL-2-10-559	**Manager:**
			IPR		
					Engineer:

Title: Humidity separator problem:a) Humidity separator B water bypassb) Humidity separator A trickle bypass (ORB)

Summary: DISCUSSION: a) At approximately 011:08:18 G.m.t., the crew reported that free water was exiting from humidity separator B. Video showing the water exiting from the humidity separator was downlinked, giving ground personnel a first-hand view of the problem. The crew switched to humidity separator A and noted no free water exiting this unit. The crew then removed the lithium hydroxide canister stowage box and performed the free fluid disposal in-flight maintenance procedure to clean up the water from humidity separator B.

b) At approximately 014:20:12 G.m.t., the crew reported small amounts of water trickling from humidity separator A. This trickle flow continued throughout the remainder of the mission. The crew removed the free water with the fluid disposal wand and towels. The water tanks were depressurized to decrease the back pressure on the humidity separators in an unsuccessful effort to stop the trickle flow. Postflight, both humidity separators were removed and sent to the vendor for troubleshooting. The acceptance test procedure was run on both separators in an unsuccessful attempt to reproduce the problem while flowing water at the specification rate of 3.8 lb/hr. However, debris was filtered out of the water exiting the humidity separator during the test. A subsequent internal inspection of the humidity separators showed that debris was present in the separators. A borescope inspection of the OV-102 cabin heat exchanger revealed debris on the slurper bars and in the heat exchanger. CONCLUSION: The problem was most likely caused by debris in the atmosphere revitalization system ducts or the debris seen in the heat exchanger. Portions of this debris could have been transferred to the humidity separators and blocked either the pitot tube or the metering holes during the flight, thus creating the carry-over condition. CORRECTIVE_ACTION: The OV-102 cabin heat exchanger was air flushed, and this forced the loose debris out. The cabin fan pressure-drop measurement decreased 0.6 inch of water after the flush, indicating that the debris had been restricting some flow through the heat exchanger. Similar air flushes will be performed on the other orbiters. The humidity separators will be cleaned and retested at the vendor prior to being returned to the flight inventory. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:00:34	Problem	**FIAR**	**IFA** STS-32-V-08	D&C - Panels
GNC-01	**GMT:** 010:13:09		**SPR** None	**UA**	**Manager:**
			IPR 35RV-0013	**PR**	
					Engineer:

Title: Forward DAPB Select Switch Contact Failure. (ORB)

Summary: DISCUSSION: Contact number 1 on the ORBITAL DAP SELECT B pushbutton switch (S2) on panel C3 was declared failed by redundancy management (RM) at approximately 010:13:09 G.m.t. This switch has three redundant sets of contacts. The switch RM runs at 6.25 Hz and will annunciate a contact failure if it detects any one of the three contacts closed for 480 milliseconds (3 cycles) or longer prior to closure of the remaining contact(s). In this case, data indicate that contact 1 was closed for five cycles prior to closure of contacts 2 and 3 and therefore, was declared failed. Once a contact is declared failed, the flight software ignores all inputs from the contact and it is not recoverable during the flight. The DAP SELECT B switch continued to function for the remainder of the mission with the remaining two contacts.

Postflight troubleshooting verified that all contacts functioned properly when the switch was depressed firmly; however, contact 1 could be actuated early when the switch was depressed slowly. This phenomenon is a known characteristic of this type of pushbutton switch when it is actuated slowly, or at an angle, or when partially depressed. Similar in-flight anomalies were documented during STS-4 (OV-102) on the forward DAP control auto switch, and during STS-51A (OV-103) on the forward rotation roll pulse switch. In all cases, the condition was repeatable by slow actuation of the pushbutton and this resulted in non-simultaneous closure of the contacts. Previous anomalies were closed as explainable and acceptable conditions. This type of switch is used in numerous locations on the Orbiter and several hundred of them are in the inventory. Sample testing has shown that most of the switches will exhibit this characteristic when not actuated firmly and briskly. Previous crews have reported that extra

care was necessary to insure that firm pressure was applied to pushbutton switches while in zero g. CONCLUSION: The deselection of contact 1 was most likely induced by slow actuation of the pushbutton switch. CORRECTIVE_ACTION: Fly as is. Flight crew will be briefed on the significance of brisk actuation of this type of pushbutton switch. EFFECTS_ON_SUBSEQUENT_MISSIONS: Anomaly recurrence will result in loss of one level of redundancy, but not in loss of switch function. A subsequent contact failure would result in an RM dilemma, in which case the switch on the aft DAP panel may be utilized.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR** BFCE-213-F004	**IFA** STS-32-V-09	GFE
None	**GMT:** Prelaunch		**SPR**	**UA**	**Manager:**
			IPR None.	**PR**	
					Engineer:

Title: MS-3 Light Damaged During Crew Entry (GFE)

Summary: DISCUSSION: During crew ingress on the first launch attempt, two pins which aid in mounting the MS-3 light were found bent. The light could not be mounted with these two bent pins. After the scrub, the two pins were removed and replaced, and the light was successfully mounted for the second launch attempt.

CONCLUSION: The cause of the bent pins is unknown. The most likely cause is that the light was stepped on or otherwise stressed during crew ingress. CORRECTIVE_ACTION: The two bent pins were removed and replaced at KSC for this flight. These pins will be inspected and their integrity verified by FEPC prior to any future flights of this light. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 004:00:57	Problem	**FIAR**	**IFA** STS-32-V-10	D&C - Lighting
EECOM-03	**GMT:** 013:13:32		**SPR** 32RF11	**UA**	**Manager:**
			IPR 35RV0003	**PR**	
					Engineer:

Title: Forward Bulkhead Floodlight Inoperative (ORB)

Summary: DISCUSSION: At approximately 13:13:32:21 G.m.t., the crew reported that the forward bulkhead floodlight had failed the previous evening. During a subsequent attempt to reactivate the floodlight, data revealed a 2-second 5-ampere load increase on main bus B, which is indicative of the floodlight electronics assembly power source (10 ampere remote power controller) going into over-current protection. It was concluded that an electrical short existed in the floodlight circuit and the unit was declared inoperative for the remainder of the flight.

Postflight troubleshooting isolated the problem to an electrical short in the floodlight electronics assembly (FEA) 1. CONCLUSION: The cause of the forward bulkhead floodlight failure was an electrical short in the FEA 1. CORRECTIVE_ACTION: The FEA 1 was removed, replaced, and reverified. The defective FEA 1 unit has been sent to the NASA Shuttle Logistics Depot for failure analysis and repair. The results of this activity will be tracked via CAR 32RF11. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:05:21	Problem	**FIAR** B) B-FCE-029-	**IFA** STS-32-V-11	CCTV
A) INCO-03, B) INCO-04,	**GMT:** 012:17:56		F016; C) B-FCE-029-F015	**UA**	**Manager:**
C) INCO-05, D) INCO-07			**SPR**	**PR**	
			IPR None		**Engineer:**

Title: Closed Circuit Television Failures (GFE)

Summary: DISCUSSION: a) At approximately 012:17:56 G.m.t., close circuit television (CCTV) camera A was noted to have a small dark spot near the center of its image. The spot did not degrade the operational capabilities of the camera image. This spot resulted from a burn on the camera's silicon intensifier tube (SIT). The burn was probably caused by the camera being exposed to excessive illumination.

b) At approximately 014:00:46 G.m.t. a line across the image from the RMS elbow CCTV camera was noticed. The line on the image was the actual line between two color filters on the color wheel which had ceased rotating. Subsequent troubleshooting at KSC indicated that the problem was within the camera's lens assembly which would not respond to any commands. c) At approximately 014:01:20 G.m.t., the image from CCTV camera C was noted to be filled with horizontal white lines during low light operations. The image appeared nominal in sunlight. This behavior indicated that electrical arcing was occurring within the high voltage image intensifying circuitry. d) At approximately 014:11:35 G.m.t., the image from CCTV camera D was noted to have a small dark spot to the right of center. The spot did not degrade the operational capability of the camera image. This spot was also caused by a burned SIT tube. CONCLUSION: a) Camera A experienced a minor burn on its SIT tube. b) The RMS elbow camera experienced a failure that rendered its lens assembly inoperable. c) Camera C most likely experienced electrical arcing in its high voltage image intensification circuitry. d) Camera D experienced a minor burn on its SIT tube. CORRECTIVE_ACTION: a) Fly as-is. The dark spot does not degrade the usefulness or reliability of CCTV camera A. b) The RMS elbow camera lens assembly has been returned to the vendor for repair and failure analysis. c) CCTV camera C has been returned to the vendor for repair and failure analysis. d) Fly as-is. The dark spot does not degrade the usefulness or reliability of CCTV camera D. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:02:25	Problem	**FIAR** RMS 4309	**IFA** STS-32-V-12	RMS
PDRS-02	**GMT:** 012:15:00		**SPR**	**UA**	**Manager:**

IPR **PR** RMS 201-017

Engineer:

Title: Remote Manipulator System (RMS) Master Alarm Sounded With No Accompanying Lights or Messages (RMS)

Summary: DISCUSSION: On flight day 4, the RMS master alarm (an alarm on the RMS display and control (D&C) panel A8U that is totally separate from the Orbiter master alarm) sounded twice for several seconds with no associated master alarm light, caution and warning (C&W) lights or fault messages. The alarm was different in frequency and volume that the normal master alarm and could not be reset. A self-test was performed and the entire RMS C&W system including the master alarm tone were functional. This problem did not recur for the remainder of the mission.

CONCLUSION: This anomaly is believed to be caused by an intermittent failure within one of the two serially connected audio modulators which together make up the master alarm tone generator. CORRECTIVE_ACTION: The RMS D&C panel, A8U, has been removed and sent to SPAR for failure analysis and repair. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. This failure is not considered generic in nature and the crew can utilize the C&W lights and messages to recognize and respond to anomalies should the master alarm tone generator fail completely.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:08:40	Problem	**FIAR** RMS 3336	**IFA** STS-32-V-13	RMS
PDRS-03	**GMT:** 012:21:15		**SPR**	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Remote Manipulator System (RMS) Wrist Roll Joint "CONTR ERR" Messages (RMS)

Summary: DISCUSSION: At 012:21:13 G.m.t., while driving the wrist roll (WR) joint negative (counter clockwise) with the RMS in the pre-cradle position (post LDEF retrieve), the tachometer data consistency check BITE annunciated a "CONTR ERR" message against the wrist roll joint. This error was annunciated as the wrist rolled through -171.6 degrees. As a result of the error the brakes were automatically set. RMS operations were recovered by manually setting the brakes and then releasing them.

On the following flight day, in-flight troubleshooting was able to recreate the problem. Data indicated that the wrist joint angle encoder exhibited inconsistent data at approximately the 175.3 degree position (raw encoder data) and covering about .2 degrees. This problem did not affect future RMS operations as the wrist was not rolled through this angle for the remainder of the mission. CONCLUSION: The most likely cause of this anomaly is contamination on the RMS wrist roll encoder. A small piece of contamination would manifest itself as inconsistent data from that position on the encoder. Further, this problem occurred after the LDEF was retrieved and there was significant contamination associated with the satellite. CORRECTIVE_ACTION: The RMS, serial number 201, has been shipped back to SPAR for failure analysis and repair. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:06:53	Problem	**FIAR**	**IFA** STS-32-V-14	Active Thermal Control
EECOM-04	**GMT:** 014:19:28		**SPR** 32RF12	**UA**	Subsytem
			IPR 35-V-0016	**PR**	**Manager:**
					Engineer:

Title: FES Topping Duct Aft B Heater Failed (ORB)

Summary: DISCUSSION: After the flash evaporator system (FES) topping duct B heater was turned on at approximately 014:18:20 G.m.t., the aft duct temperature (V63T1802A) increased only a few degrees. This inducted that the aft portion of the B heater was not functioning and the slight increase in temperature was caused by heat conduction from the forward portion of the duct where the B heater was functioning properly. The crew then switched to the A heaters which functioned nominally. Later in the flight, the crew activated the C heaters which also performed nominally and verified that redundant topping duct heating still existed.

Postflight troubleshooting at KSC revealed no anomaly with the B heaters in the topping duct. Electrical testing upstream of the heaters indicated that mid-power controller assembly 2 (MPCA-2) was not supplying power to the heater circuit. CONCLUSION: The FES topping duct B heater anomaly was caused by MPCA-2 failing to power the heater circuit. CORRECTIVE_ACTION: MPCA-2 has been removed and replaced. The removed assembly has been shipped to Rockwell-Downey for failure analysis. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:13:07	Problem	**FIAR**	**IFA** STS-32-V-15	IMU
GNC-02	**GMT:** 015:01:42		**SPR** 32RF13	**UA**	**Manager:**
			IPR	**PR** GNC-2-10-0058	
					Engineer:

Title: Inertial Measurement Unit 1 Failed by Redundancy Management (ORB)

Summary: DISCUSSION: During the STS-32 mission, inertial measurement unit (IMU) 1 (serial number 24) exhibited seven occurrences of erratic Y-axis accelerometer outputs. The accumulated Y-axis velocity indicated a negative acceleration when it should have been indicating a positive accelerometer bias. At approximately 015:01:42 G.m.t., IMU 1 was failed by redundancy management (RM). A manual reselection of IMU 1 was performed. No annunciation of an IMU hardware BITE occurred during this period. After this anomaly occurrence, the IMU was closely monitored during the remainder of the flight for any recurrence of the problem. Performance remained nominal. Postflight analysis revealed that the inner roll resolver angles decreased at the times that correspond to the Y-velocity upsets. Due to the time synchronization of

the perturbations on both the Y accelerometer and the inner roll, it is most likely that the perturbations have something in common. Exhaustive testing performed at JSC on the IMU has yet to recreate this anomaly. The vendor has located places inside the platform on a circuit board where the Y accelerometer and the inner roll signal functions are located close together. There is no conformal coating on the circuit board. A common failure mode has, however, not been determined. Plans are to continue the investigation. This IMU has had no previous failures.

CONCLUSION: The anomaly was a transient event lasting for 66 seconds over a 502-second period. The cause is currently unknown and is considered a non-generic first time occurrence. CORRECTIVE_ACTION: A spare IMU (serial number 25) has been installed on OV-102. The IMU (serial number 24) was sent to JSC for testing (CAR 32RF13). The vendor in parallel performed a circuit analysis. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. In-flight transient IMU failures are handled via manual reselection/realignment as was performed on STS-32. Had the failure occurred during prelaunch operations, the Launch Commit Criteria (LCC) requires 3 operational IMU's to remain two-fault tolerant (Reference GNC-60 IMU Failure Indication LCC).

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:20:41	Problem	**FIAR**	**IFA** STS-32-V-16	HYD
MMACS-04	**GMT:** 010:09:16		**SPR** 32RF16	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Hydraulic System 1 and 2 Pilot Valve Leakage within Unloader Valves (ORB)

Summary: DISCUSSION: During the STS-32 scrub, the hydraulic system 2 unloader valve demonstrated leakage greater than that allowed by the preflight waiver. The system 2 unloader valve cycled 10 times during prelaunch operations as compared to 4 and 6 cycles for systems 1 and 3. The system performed nominally during prelaunch operations the following day and this indicated a clearing of the unloader pilot valve.

During flight day 4, accumulator 1 was recharged 5 times during a 8-hour period. The high cycle rate of the valves was caused by leakage of the pilot-valve upper ball. The system 1 circulation pump was operated continuously for 4 hours. During this time, accumulator 1 recharged once, and the bootstrap system operated normally for the remainder of the mission, thus indicating a clearing of the pilot valve. The system 1 and 2 unloader valves eventually held pressure, thus indicating transient contamination had been dislodged from the pilot valves. The hydraulic system unloader valves have historically been susceptible to particle contamination. CONCLUSION: The accumulator pressure decay signatures are an indication of improperly seated pilot valve caused by transient contamination. CORRECTIVE_ACTION: During troubleshooting the system 2 unloader valve, performance was accpetable, and it is recommeded to fly as is. System 1 unloader valve exceeded the allowable leak rate and is scheduled for removal and replacement. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:21:29	Problem	**FIAR**	**IFA** STS-32-V-17	HYD
MMACS-05	**GMT:** 011:10:04		**SPR** 32RF17	**UA**	**Manager:**
			IPR 35-RV-0022; 35-RV-0023	**PR**	**Engineer:**

Title: Water Spray Boiler System 2 and 3 Regulator Pressure Decay (ORB)

Summary: DISCUSSION: After ascent, water spray boiler (WSB) system 2 and 3 gaseous nitrogen (GN2) regulator outlet pressures decayed from 28 to 16.2 and 14.7 psia, respectively, prior to entry, indicating either a GN2 leak or a water leak. Calculation of the pressure decay rate over the entire 11-day flight, showed that the decay rates were within the required specification rate of no more than 0.06 psi/hr. The leakage was minimal and decreased with the loss of pressure. The pressure decay started at approximately 0.1 psi/hr and stabilized at an acceptable 0.03 psi/hr rate.

Although WSB nitrogen regulator outlet pressure decays have been noted on previous flights (reference flight problem reports STS-8, -51A, -51J, and -61B), these decays have had no mission impact because the nitrogen supply is protected by an isolation valve. WSB system 2 and 3 water tanks will be off loaded to verify that the pressure decays were the result of GN2 leakage and not caused by water leakage (Chit J3190). CONCLUSION: The WSB 2 and 3 gaseous nitrogen regulator pressure decay was caused by the relief valve not properly seating after ascent. The leakage of the WSB relief valve could be caused by a set in the relief valve poppet seat material. The relief valve poppet seat material is susceptible to taking a set which could result in out-of-specification leakage after reseat. CORRECTIVE_ACTION: The WSB 2 and 3 relief valves will be removed, and the valve poppet seal material will be replaced with a material which is less susceptible to taking a set. The reconfigured relief valves will be reinstalled as a -0004 configuration and verified per OMRSD. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-32-V-18	C&T - S-Band
INCO-08	**GMT:**		**SPR**	**UA**	**Manager:**
			IPR 35-V-0017	**PR** COM-2-10-0151	
					Engineer:

Title: Multiple S-band Forward Link Dropouts (ORB)

Summary: DISCUSSION: A large number of unexplained communication dropouts occurred intermittently throughout the mission when using the S-band forward link through the Tracking and Data Relay Satellite (TDRS). The dropouts occurred while operating through both the East and West TDRS, while utilizing either of the redundant strings of the S-band pulse-modulation (PM) equipment, and at both high and low frequencies. These dropouts occurred when the received signal strength was

sufficient to normally maintain a good communications link. Although the dropouts occurred predominantly when the lower right antenna was selected, similar dropouts also were observed when using the other antennas. Analysis of flight data indicated that these dropouts did not have a failure signature that was similar to previous S-band problems involving antennas or switches.

Postflight troubleshooting tests revealed dropouts similar to the flight anomalies observed on the lower right antenna. In addition to the forward link dropouts, a simultaneous loss in the transmitted power was detected. Segments of the RF coaxial cable path were removed to isolate the loss and some discrepancies were observed in the cables. These included higher-than-expected operating temperatures, low connector-breaking torque, discoloration, and indications of possible contamination. One segment of cable, located at the antenna switch, was returned to the Orbiter contractor for further analysis. The other three cable segments at the antenna switch (one for each of the S-band antenna paths) were cleaned and re-installed with the proper connector torque. During further troubleshooting, the power loss in the lower right RF path changed from an intermittent condition to a permanent loss. Four of the five series coaxial cable segments for this path were removed, one segment at a time, to isolate the loss. While the losses for the individual cables were slightly out of specification and some discoloration was observed, the most significant portion of the total loss was in the antenna. After removal and replacement of the antenna and three accessible cables, the loss of this path was measured and was at expected values. The disposition of these three cables will be via problem report (PR) action. A total system retest cannot be completed until the tile has been replaced over the antenna. Successful completion of this retest will be documented via PR COM-2-10-0151. CONCLUSION: A failure of the lower right antenna is the most probable cause for the communication dropouts. Some additional degradation was observed at the junctions of the RF coaxial cables, and this may have contributed to the communication dropouts. CORRECTIVE_ACTION: The lower right antenna was removed, replaced, and returned to the vendor for failure analysis. Four coaxial cables were removed, replaced, and returned to the Orbiter contractor for further analysis. The results of this activity will be tracked via IM32RF18. The S-band antenna retest results will be known at the completion of PR COM-2-10-0151. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending the results of retest and failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 008:03:33	Problem	**FIAR**	**IFA** STS-32-V-19	Atmospheric
EECOM-07	**GMT:** 017:16:08		**SPR** 32RF20	**UA**	Revitalization Subsytem
			IPR	**PR** ECL-2-10-560	**Manager:**
					Engineer:

Title: Avionics Bay 3A Smoke Detector A Transient False Alarms (ORB)

Summary: DISCUSSION: An unexplained smoke alarm was annunciated at approximately 17:16:08 G.m.t. for 11 seconds on smoke detector A in avionics bay 3A. The smoke concentration output of all sensors at the time of the alarm remained at the normal background level which is well below the alarm trip point. A subsequent self-test indicated that all the detectors were operating properly. Four more false alarms were annunciated before the crew unpowered smoke detector A by opening its circuit

breaker. The redundant smoke detector B remained operable for the rest of the mission and provided adequate smoke detection capability for avionics bay 3A.

A similar anomaly occurred on STS-61A. The cause of that anomaly could not be found. CONCLUSION: The cause of the transient false smoke detector alarms will be determined through failure analysis at the vendor. CORRECTIVE_ACTION: The avionics bay 3A smoke detector A has been removed and replaced. The removed detector has been sent to the vendor for failure analysis. The replaced detector will be verified under OMRSD requirement V62AP0.020. Should the problem recur, redundant smoke detectors exist in each avionics bay as well as the crew cabin. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending failure analysis results.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:05:38	Problem	**FIAR** None	**IFA** STS-32-V-20	RMS
PDRS-01	**GMT:** 009:18:13		**SPR** None	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Multiple Remote Manipulator System (RMS) Brake Slip Messages Annunciated When The Arm Was Deselected (RMS)

Summary: DISCUSSION: On three separate occasions during the mission, when the RMS was deselected, multiple "PDRS Slip" messages were annunciated. These messages are annunciated if a significant joint angle change is sensed while the brakes are on; however, in each case when the message was annunciated the joint angles did not change.

CONCLUSION: Investigations indicated a timing problem exists between the GPC and the Manipulator Controller Interface Unit (MCIU) that affects the termination sequence of the GPC brake slip BITE algorithm in the GPC cycle in which the arm is deselected. This problem can occur anytime the arm is deselected; and, though it is a nuisance, it does not affect RMS operations. CORRECTIVE_ACTION: Change Request (CR) 90198, to the RMS flight software, is in work to prevent these timing errors. User Note/DR 103936 "Unexpected Slip Annunciations During RMS Power Down" is in place until the problem is resolved.
EFFECTS_ON_SUBSEQUENT_MISSIONS: None. The above referenced User Note is in place for STS-31 and subsequent flights.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 008:16:00	Problem	**FIAR**	**IFA** STS-32-V-21	Water and Waste
EECOM-08; EECOM-09	**GMT:** 018:04:35		**SPR** 32RF21	**UA**	Management System
			IPR 35-V-0021	**PR**	**Manager:**

Engineer:

Title: Waste water dump line/nozzle blockage. (ORB)

Summary: DISCUSSION: At approximately 018:04:35 G.m.t., the crew reported that their flight day 10 post-sleep free fluid disposal (performed due to humidity separator problems) was unsuccessful because the free fluid disposal wand had no suction. The crew cycled the waste dump valve twice and this failed to alleviate the problem. Television downlink of the waste dump nozzle as well as thermal data from the waste dump line indicated no ice blockage within the system. The crew completed the free fluid disposal using towels to absorb the water.

At approximately 018:13:29 G.m.t. a waste water dump was attempted, but was unsuccessful. No decrease in the waste-tank quantity was seen while the nozzle heat-up signatures, dump-valve response, and waste-water dump-line temperatures appeared normal. This phenomenon indicated that the blockage that prevented the free water disposal was actually in the waste dump line. Since the waste tank had sufficient ullage volume to complete the mission, completion of the waste dump was not necessary. Postflight troubleshooting revealed that a sludge-type material had been blocking the dump line or nozzle. A sample was taken and an analysis of the material is being performed. CONCLUSION: The blockage was most likely cabin debris material that was pulled into the waste dump line during the free fluid disposal operations. Analysis of the debris sample will be used to confirm this. CORRECTIVE_ACTION: The waste dump valve and nozzle have been removed and replaced. The waste dump line was flushed and cleaned with fresh water. Beginning with STS-36, a finer screen was placed on the free fluid disposal wand to prevent more cabin debris from being introduced into the waste dump line. Efforts to develop an even more effective filter for the wand have been initiated.
EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 010:17:41	Problem	**FIAR**	**IFA** STS-32-V-22	BFS
DPS-01	**GMT:** 020:06:16		**SPR** 32RF22	**UA**	**Manager:**
			IPR 35-V-0015	**PR**	

Engineer:

Title: Backup Flight System General Purpose Computer Errors (Input/Output Terminate) (FSW)

Summary: DISCUSSION: At approximately 020:06:16 G.m.t., the general purpose computer (GPC) in which the backup flight system (BFS) software was resident registered numerous GPC error code 41's (illegal engage - input/output (I/O) terminate B). The error is the result of the BFS detecting an illegal (false) I/O terminate B discrete when the engage discretes are not present. The I/O terminate B is generated in the backup flight controller (BFC), module B into discrete (DI) 13. The error was logged approximately 43 times before the GPC was halted. As a result, the BFS was moved from GPC 5 to GPC 2 and reinitialized. The GPC set was restrung and GPC 5 was powered off for the remainder of the mission. The problem repeated on two separate occasions at KSC; however, the troubleshooting failed to isolate the problem.

Since that time, the problem had not recurred at KSC nor has it recurred at the vendor. The suspect input/output processor (IOP) and BFC for GPC 5 were removed, replaced, and the removed units were sent to their respective vendors. This is the first occurrence of a toggling I/O terminate B.

CONCLUSION: The cause of the failure is unknown at this time. Testing is continuing on the internal components of the BFC and the IOP. CORRECTIVE_ACTION: A spare IOP (serial number 21) and BFC (serial number 14) have been installed on OV-102. The IOP (serial number 22) and BFC (serial number 6) that were removed were sent to their respective vendors for failure analysis. (The CAR numbers are 32RF22-010 for the IOP and 32RF22-100 for the BFC.) EFFECTS_ON_SUBSEQUENT_MISSIONS: None. The toggling I/O terminate B is an isolated case and not indicative of a generic problem. In-flight GPC failures are handled via GPC reconfiguration as was performed on STS-32.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 010:20:40	Problem	**FIAR**	**IFA** STS-32-V-23	HYD
MMACS-07	**GMT:** 020:09:15		**SPR** 32RF24	**UA**	**Manager:**
			IPR 35-RV-0033	**PR**	
					Engineer:

Title: Water Spray Boiler 3 Controller "A" Overcooling (ORB)

Summary: DISCUSSION: Water Spray Boiler (WSB) controller 3A detected a high hydraulic fluid temperature that resulted in an early switchover to the heat exchanger mode during entry. An overcooling of auxiliary power unit (APU) 3 lube oil occurred soon afterwards. The crew switched to controller 3B and the lube oil temperature recovered 13 minutes later, indicating nominal operation of WSB controller 3B.

Reservoir temperature for hydraulic system 3 was approximately 114?F when the system switched to heat exchanger mode. Normally hydraulic fluid bypasses the WSB until the fluid temperature reaches 210?F. At this temperature, the fluid is routed through the WSB heat exchanger and water spraying was initiated. CONCLUSION: Postflight testing has isolated the overcooling anomaly to an internal controller 3A malfunction. CORRECTIVE_ACTION: WSB controller 3A was replaced and successfully tested. The failed unit has been returned to the vendor for failure analysis and will be tracked by CAR 32RF24. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:03:30	Problem	**FIAR**	**IFA** STS-32-V-24	C&T - Ku-band
None	**GMT:** 011:16:05		**SPR** 32RF25	**UA**	**Manager:**
			IPR 35RV0032	**PR**	

Engineer:

Title: The Ku-band Antenna Feed Heater Performance was Erratic. (ORB)

Summary: DISCUSSION: Beginning at approximately 11:16:05 G.m.t., the Ku-Band antenna feed heater failed to energize at the preset value of 0 ? 5 ?F. Data indicated that the heater activated at a temperature of -21 ?F while the system was operating, and at -31 ?F after the system was turned off. While the heater was activated, there were several indications of intermittent operation. The temperature signature was not indicative of a failed thermostat. The erratic behavior of the antenna feed heater did not affect the Ku-Band performance during the remainder of the mission.

Postflight troubleshooting at KSC has determined that the antenna feed heater element and the temperature sensor were both functional at ambient temperatures. The electrical power source for this element is common to three other heater elements within the deployed assembly (DA), and these functioned nominally. This isolated the in-flight problem to the antenna feed heater power circuit. CONCLUSION: The most probable cause of the erratic performance of the Ku-band antenna feed heater was an intermittent condition in the power circuit. CORRECTIVE_ACTION: The DA S/N 105 was removed, replaced, and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 32RF25. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending the results of failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-32-V-25	MPS
None	**GMT:** Postlanding		**SPR** 32RF26	**UA**	**Manager:**
			IPR	**PR** MPS-2-10-0607	

Engineer:

Title: MPS LH2 Outboard Fill and Drain Relief Valve Leak (ORB)

Summary: DISCUSSION: During postlanding operations at Dryden Flight Research Facility, a blowing leak was discovered at the liquid hydrogen (LH2) outboard fill and drain valve (PV11). When the LH2 manifold was pressurized to 40 psi, the audible leak was again observed and was determined to be emanating from the relief valve.

An inspection of the relief valve at KSC showed that the leak had been caused by contamination between the poppet and seal. A detailed inspection of the main propulsion system (MPS) LH2 lines and components revealed contamination in many areas. Analysis showed that the contaminant consisted of an abrasive material similar to sandpaper and stainless steel. No evidence of this contaminant was seen following the prior flight of OV-102 (STS-28), and no significant rework was done to the LH2 system during Orbiter Processing Facility (OPS) turnaround. Inspection of the liquid oxygen prevalve screens revealed no contamination. This flight used Mobile Launch Platform (MLP)-3 for the first time. A postflight inspection of MLP-3 revealed a large number of small metal particles in the LH2 line between the 70-micron filter and the tail service module interface. This contamination was most probably entrapped in the system during MLP-3 construction. A complete inspection of the MPS LH2 system could not be accomplished. Additionally, some minor known contamination could not be removed. It is estimated that the remaining particles are 1000 microns in size or

less. Since the main engines are capable of ingesting particles less than 1000 microns and the 1000-micron feedline screens will filter out larger particles, the remaining contamination should have no effect on the next mission of OV-102. CONCLUSION: The relief valve leak was caused by contamination that was present in much of the MPS LH2 system. The contaminants were most probably introduced into the system from MLP-3, which was used for the first time on this mission. CORRECTIVE_ACTION: The contaminated MPS LH2 lines and components were cleaned as much as possible. The small amount of particles that are known to remain in the system were judged to be acceptable. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-32-V-26	STR
None	**GMT:** Postlanding		**SPR** 32RF27	**UA**	**Manager:**
			IPR	**PR** PYRO-2-10-0075	
					Engineer:

Title: Forward Orbiter/External Tank Separtion Assembly Stop Bolt Slightly Deformed (ORB)

Summary: DISCUSSION: During the postflight inspection of OV-102, the right-hand stop bolt on the forward Orbiter/External Tank (ET) separation assembly centering mechanism was noted to be slightly deformed at the tip. Markings on the bearing plate indicated some movement had occurred. These stop bolts are non-structural components that are designed to restrict the roll movement of the ET yoke during the Orbiter/ET mating process. Analyses show that no known flight loads exist that could produce sufficient loads to damage the stop bolts. The most probable source of this minor deformation was forward motion that occurred after separation. A slight deformation bolt was still within drawing specifications, but was removed and sent to Rockwell-Downey for evaluation.

CONCLUSION: This slight deformation is expected under nominal conditions. The bolt functioned as designed. CORRECTIVE_ACTION: Although the deformed bolt has been removed and replaced on OV-102, no corrective action is required. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-32-V-27	CREW
None	**GMT:** Postlanding		**SPR** 32RF28	**UA**	**Manager:**
			IPR 35-V-0006	**PR**	
					Engineer:

Title: Pilot Seat Would Not Drive Down (ORB)

Summary: DISCUSSION: During the crew debriefing, the Pilot reported that he tried to drive his seat downward five times (four attempts during entry and once after wheelstop), all of which were unsuccessful. Downward movement was attempted to no avail on each of the redundant ac busses that power the seat; however, the seat did

drive upwards when commanded. No attempts were made to move the seat prior to experiencing the problem.

However, during postflight operations at the landing site and KSC, the seat functioned nominally. No hardware problems were noted which could have contributed to the seat drive problem. Troubleshooting efforts at JSC included attempting to reproduce the problem in the 1-g trainer, examining the switches in the trainer for possible "teasing" phenomena, and examining the flight ac bus current traces for further evidence. The problem could not be reproduced in the trainer, and the ac bus traces provided no further information. Examination did show that the drive switch could be placed into a false detent position prior to reaching the down position. However, this was considered an unlikely cause of the problem since the pilot made five distinct attempts to drive the seat downward and did succeed in driving the seat upwards. An intermittent sticking of the down limit-switch, which normally opens the seat motor circuit once the seat had driven to its full down position, was also considered. A history check on this seat revealed that after vibration tests were performed on this seat, a bolt on the down limit-switch was found loose. This bolt was torqued to specification at which time it was found that the bolt was of incorrect length. The bolt was then replaced with the proper size bolt. Torqueing the shorter bolt may have applied a side load on this limit-switch which could have caused intermittent sticking of the switch. CONCLUSION: The most likely cause of this problem was an intermittent sticking of the down limit-switch. CORRECTIVE_ACTION: The pilot seat down limit-switch assembly will be removed and replaced. The removed assembly will be sent to the vendor for failure analysis. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR** B-FCE-029-F017	**IFA** STS-32-V-28	Hand Held Mic
None	**GMT:** Postlanding		**SPR**	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Hand-held Microphone Had Degraded Communications (GFE)

Summary: DISCUSSION: Ground control reported that downlink voice was consistently distorted and hard to understand when the crew was using one of the three hand-held microphones (HHM). The HHM was replaced with another hand-held microphone unit, and there was no further impact to the mission in this communications mode. The defective HHM was stowed for the remainder of the mission.

The anomalous HHM, serial number 1016, was returned to the JSC Flight Equipment Processing Contractor (FEPC) where postflight failure inspection showed that one of the two microphone wires was open at the amplifier printed circuit board. This is considered a random failure and probably occurred because of a cold solder joint or because of vibration and movement of the wire at the solder connection during the prolonged usage. This particular HHM has flown on numerous missions. CONCLUSION: The degraded communications was caused by an open microphone wire at the printer circuit board of the HHM (serial number 1016). CORRECTIVE_ACTION: The anomalous HHM has been removed from flight inventory and the defective unit is being further evaluated by the JSC FEPC. The results of this activity will be tracked via FIAR B-FCE-029-F017. EFFECTS_ON_SUBSEQUENT_MISSIONS: None expected. There are at least two HHM's manifested on each

flight and the lightweight headsets can be used as backup for communications.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR** B-FCE-028-F004	**IFA** STS-32-V-29	GFE
none	**GMT:** Postlanding		**SPR**	**UA**	**Manager:**
			IPR	**PR** PV6-151/63-Z	
					Engineer:

Title: Orbiter Portside Gas Sampler System Assembly Failed to Operate. (GFE)

Summary: DISCUSSION: Postflight inspections revealed that the gas sampler system assembly on the 50-1 access door (port side) failed to operate. The starboard side assembly operated nominally. These gas sampler assemblies pyrotechnically open sample bottles at certain points during ascent. The samples are then tested postflight for hazardous gas concentrations. The failure of this system represented no impact to crew safety or mission success.

Postflight troubleshooting has shown no problems with the pyrotechnics or with the battery package and cables that power the system. Troubleshooting of the system's electronics package and activating microphone is scheduled to be performed. CONCLUSION: The failure-to-operate was most likely caused by an anomaly in the gas sampler electronics package or the microphone. CORRECTIVE_ACTION: This gas sampler unit has been removed from the flight inventory until the exact cause of the problem can be determined and repaired. Failure analysis of the gas sampler system will be conducted under FIAR B-FCE-028-F004.
EFFECTS_ON_SUBSEQUENT_MISSIONS: None